


REMARKS

The specification, claims and abstract have been revised for preferred U.S. practice, *inter alia*, by eliminating multiple dependent claims, characterizing clauses and reference numerals and possible method limitations in the apparatus claims. Entry is in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & BERNER, LLP


Allan M. Lowe
Registration No. 19,641

1700 Diagonal Road, Suite 310
Alexandria, Virginia 22314
(703) 684-1111 AML/tal
Facsimile: (703) 518-5499
Date: January 13, 2006

IAP20 Rec'd PCTO 13 JAN 2006

Component for a circuit board and method for inserting said
component into a circuit board

RELATED APPLICATIONS

5 The present application is national phase of
PCT/EP2004/007440 filed July 7, 2004 which is based on, and
claims priority from, German Application Number 103 31 840
A1, filed July 14, 2003, the disclosures of which are
10 hereby incorporated by reference herein in their entirety.

FIELD OF THE INVENTIONDescription

 The present invention relates to a component for a
15 circuit board, having a housing on which at least one peg
is designed for engaging in a hole in the circuit board,
whereby the peg has at least one detent lug which projects
in the radial direction relative to the peg beyond its
outer periphery, ~~according to the preamble of claim 1.~~ The
20 invention also relates to a method for inserting a
component of this type into a circuit board, ~~according to
the preamble of claim 6.~~

BACKGROUND OF THE INVENTION

25 In order to equip a circuit board with components, for
some components, it is necessary additionally to fasten
them mechanically to the circuit board with a peg having a
latching device. By this means, the peg penetrates a hole
in the circuit board, whereby a detent lug on the
30 penetrating end of the peg latches onto the side of the
circuit board opposed to the component and thereby
mechanically fixes the component once it has been inserted.
It is, however, disadvantageous herein that the placement
force alone is 10 N, which cannot be achieved with

conventional component inserting machines. This applies all the more to the force required for latching, which is usually in the range of 60 N to 110 N. Therefore, formerly such components have had to be inserted and latched manually. However, this entails a high cost.

It is an object of the invention to improve a component and a method of the aforementioned type such that fitting and locking of this component in a circuit board can be carried out by machine reliably and at low cost.

~~This aim is achieved according to the invention with a component of the aforementioned type having the features disclosed in claim 1 and by a method having the process steps disclosed in claim 6. Advantageous embodiments of the invention are disclosed in the further claims.~~

SUMMARY OF THE INVENTION

~~With~~ According to one aspect of the invention, a circuit board component of the aforementioned type includes a type, it is provided according to the invention that the detent lug is designed and arranged on the peg such that the outer periphery of the peg is smaller in the region of the detent lug than the diameter of the hole in the circuit board, whereby the outer periphery of the section of the peg protruding into the hole in the circuit board is designed such that between the outer periphery of this section and the inner wall of the hole in the circuit board, over at least a portion of the outer periphery there is an intermediate space with capillarity for solder, such that solder situated on the surface of the circuit board during a soldering procedure penetrates by capillary action into the intermediate space, filling it.

~~With a method of the above type, the following steps are provided according to the invention: application of~~

According to another aspect of the invention, a circuit board component is bonded to a circuit board by applying soldering paste on the circuit board round at least a portion of the periphery of ~~the a~~ hole, ~~placement of~~
5 placing the component onto said circuit board with the peg in the hole in said circuit board, heating ~~of~~ the solder arranged round the hole such that the solder penetrates by capillary action into the intermediate space with capillarity, and cooling ~~of~~ the solder which has penetrated
10 into the hole, such that it hardens.

This has the advantage that for fitting and locking the component on the circuit board, it is not necessary to apply a particularly great force, so that this work can be carried out automatically by machine in a production line
15 for circuit boards with a component inserting machine and a hot air furnace, whereby after the soldering procedure in the hot air furnace, locking of the component is automatically achieved by the solder that has penetrated into the hole in the circuit board. At the same time, a
20 tolerance-free form-fit takes place between the peg and the inner periphery of the hole in the circuit board in a plane of the circuit board. The insertion of components with locking can therefore be carried out very economically, simultaneously producing large holding forces and with
25 little tolerance.

A form-fitting connection without tolerance in the direction along a longitudinal axis of the hole in the circuit board is thereby achieved that the detent lug is designed and arranged on the peg such that with the
30 component placed fully on the circuit board, the detent lug is arranged within the hole in the circuit board.

For further promotion of the capillary action, the periphery of the peg is designed in the longitudinal

direction over the whole section situated in the hole in the circuit board with at least one cut-out.

A particularly good form-fit between the solder penetrating into the hole in the circuit board and the circuit board is thereby achieved that the hole in the
5 circuit board is metallised.

The peg is made, for example, of plastics, so that no mechanically strong connection between said peg and the solder arises.

10

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail by reference to the drawings, in which:

Fig. 1 shows a plan view of a preferred embodiment of
15 a component placed on a circuit board,

Fig. 2 shows a view of the detail X of Fig. 1 before a soldering procedure,

Fig. 3 shows a sectional view along the line A-A of Fig. 2,

20 Fig. 4 shows a view of the detail X of Fig. 1 after a soldering procedure, and

Fig. 5 shows a sectional view along the line B-B of Fig. 4.

25 DETAILED DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a preferred embodiment of a component for a circuit board 32. The component comprises a housing 10 onto which two pegs 28 are formed. In Fig. 1, the component is placed on the circuit board 32, whereby each peg 28
30 engages in a metallic hole 30 in the circuit board 32.

Figs. 2 and 3 additionally illustrate the condition of the component inserted into the circuit board before the soldering procedure, whereby metallising 56 of the hole 30

is visible. Soldering paste 50 is applied round a portion of the periphery of the hole 30 and the peg 28 protrudes into the hole 30. The peg 28 has a detent lug 52 formed at its free end, whereby the diameter of the peg 28 is smaller in the region of the detent lug 52 than the inner diameter of the hole 30. Also in the remaining section of the peg 28, which engages in the hole 30, the diameter of the peg 28 is designed to be smaller than the inner diameter of the hole 30. In addition, the length of the peg 28 is selected such that with the component placed fully into the circuit board 32, the detent lug 52 is still situated within the hole 30, as is apparent in particular in Fig. 3.

Additionally, the peg 28 is provided with cut-outs 54 in the longitudinal direction, as shown in particular in Fig. 2. The smaller diameter of the peg 28 compared with the hole 30 and the cut-outs 54 are chosen such that between the outer periphery of the peg 28 and the inner periphery of the hole 30, an intermediate space with capillary properties is formed.

In a manufacturing process wherein firstly all components are placed by a component inserting machine into the circuit board 32 and subsequently a soldering procedure takes place in a hot air furnace, the solder 50 is heated and passes to the liquid phase. The liquid solder 50 then penetrates, by means of the capillary effect and additionally supported by an adhesion force, into the intermediate space between the outer periphery of the peg 28 and the inner periphery of the hole 30 and essentially fills it completely. Before the soldering procedure, the solder 50 is herein arranged on non-metallised regions round the hole 30, whereby corresponding adhesive forces are produced in the direction of the hole 30.

Figs. 4 and 5 show the condition following cooling and hardening of the solder 50. The intermediate space is filled with solder 50 and the solder 50 has become bound to the metallising 56 of the hole 30 in form-fitting manner.

5 This alone produces a form-fitting connection between the circuit board 32 and the peg 28 in a plane of the circuit board 32. Additionally, by means of the detent lug 52, a form-fit in the direction of the longitudinal axis of the hole 30 is produced, that is, in a direction perpendicular
10 to the circuit board 32. Overall, therefore, the peg 28 is firmly connected or locked to the circuit board 32 in all three spatial directions. This connection is also able to absorb turning moments without the peg 32 becoming loosened from the hole 30. As is immediately apparent, however, no
15 insertion force or latching force has to be applied to achieve this. Locking has been automatically achieved during the soldering procedure. It is also apparent that the connection between the peg 28 and the circuit board 32 is tolerance-free.